Action contends in paragraph 10 that "Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action." This statement, however, is inaccurate since the new grounds of rejections are applied to claims that were not amended. MPEP Section 706.07(a) provides that "any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims nor based on information submitted in an Information Disclosure Statement . . . ." Thus, the new grounds of rejection applied to unamended claims mandates that this Office Action be made non-final. Applicant thus respectfully requests withdrawal of the finality of the April 22, 2003 Office Action.

Claims 1 and 17 were rejected under 35 U.S.C. §112, second paragraph. The Office Action contends that the language in claims 1 and 17 relating to the beam strength of a "correspondingly sized wood construction beam" is indefinite. The Office Action in fact questions how the strength of a correspondingly sized beam would be determined. Applicant respectfully submits, however, that those of ordinary skill in the art would readily appreciate the strength characteristics of conventional wood construction beams. Attached hereto is an excerpt from *Marks' Standard Handbook for Mechanical Engineers*, pages 12-23 through 12-25, describing properties of wood construction beams including strength characteristics by beam size. This information, of course, is readily available to those of ordinary skill in the art and evidences conventional known properties of wood construction beams.

Applicant thus respectfully submits that the rejection is misplaced. Withdrawal of the rejection is respectfully requested.

Claims 1, 2 and 5-16 were rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,580,480 to Chatelain. This rejection is respectfully traversed.

It is well settled that anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. See, e.g., *W.L. Gore & Assocs. v. Garlock, Inc.*, 220 USPQ 303, 313 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Chatelain describes a form for making a concrete fence post. After pouring concrete into the form, the form is opened and removed. See, e.g., the Abstract. In contrast, claim 1 according to the present invention defines a construction beam comprising a tubular housing filled with a solid material . . . , <u>wherein the tubular housing forms part of the construction beam</u>. Since the form in the Chatelain patent is removed, the form itself does not in any way form part of a construction beam as claimed. This important distinction is apparently overlooked in the Office Action. In view of at least this distinction, Applicant submits that the rejection is misplaced.

In addition, both the Chatelain patent and the Office Action are silent with respect to a relationship of the Poisson's ratio of the tubular housing and solid material filling the tubular housing as claimed. Even with the supporting evidence submitted with the Amendment filed January 29, 2003, the Examiner remains unwilling or unable to appreciate a basic principle of mechanical engineering. In the context of the present invention, Poisson's ratio of one or more particular materials is not "a matter of desired results of engineering calculations" as contended in the Office Action, but rather

represents structural characteristics of the defined materials. Since Chatelain is silent with respect to the claimed relationship, for this reason also, Applicant submits that the rejection is misplaced.

With respect to independent claim 14, claim 14 defines a deck system comprising a plurality of construction beams secured side-to-side. In a manner similar to that defined in claim 1, claim 14 recites that the respective tubular housings form part of each of the construction beams. As discussed above, since this subject matter is lacking in the Chatelain patent, Applicant submits that the rejection is misplaced.

Additionally, with respect to the side-to-side construction of the deck system defined in claim 14, the Office Action refers to Figure 3 in Chatelain. Figure 3, however, merely illustrates a plurality of fence posts supported in the ground. The posts are spaced from one another as is conventional in fence construction. Applicant respectfully submits that these spaced fence posts lack any remote similarity to the claimed deck system including a plurality of construction beams <u>secured side-to-side</u>. For this reason also, Applicant submits that the rejection is misplaced.

Still further, claim 14 additionally defines a relationship of the Poisson's ratio of the tubular housings and solid material filling the tubular housings, which as noted above, is lacking in the Chatelain patent.

With respect to the dependent claims, Applicant submits that these claims are allowable at least by virtue of their dependency on an allowable independent claim. In addition, claim 5 recites that the construction beam includes at least one reinforcing rod in the tubular housing, the concrete being formed in the tubular housing after placing the

reinforcing rod. In contrast, Chatelain describes that the reinforcing bars 48 are inserted after pouring the concrete. See column 3, lines 21-24. Claim 6 recites that the at least one reinforcing rod is pre-stressed prior to forming the concrete in the tubular housing. Chatelain lacks any remotely similar construction. In fact, since Chatelain is pouring its concrete as fence posts, it would be practically impossible to incorporate a pre-stressed reinforcing rod. Claim 7 recites that the tubular housing is formed of a fiber reinforced polymer. Chatelain, in contrast, describes that the form is fabricated from steel or plastic. See column 3, lines 37-40. Still other features of the dependent claims are also lacking in the Chatelain patent.

Reconsideration and withdrawal of the rejection are thus respectfully requested.

Claims 3 and 4 were rejected under 35 U.S.C. §103(a) over Chatelain. Without conceding the Examiner's contentions in paragraph 6 of the Office Action, Applicant respectfully submits that claims 3 and 4 are allowable at least by virtue of their dependency on an allowable independent claim. That is, Chatelain additionally lacks any suggestion to modify its structure to correct the deficiencies noted above with respect to, for example, claim 1. Withdrawal of the rejection is thus respectfully requested.

Claims 17-20 and 22 were rejected under 35 U.S.C. §103(a) over Chatelain. This rejection is respectfully traversed.

Claim 17 defines a method of forming a construction beam including filling a tubular housing with a solid material . . . , wherein the tubular housing forms part of the construction beam. As discussed above, this subject matter is lacking in the Chatelain patent, and as a consequence, Applicant submits that the rejection is misplaced.

Chatelain in fact expressly discloses a contrary construction where the form is opened and removed after the concrete is permitted to set. The discussion of Poisson's ratio is also relevant to claim 17, and Applicant respectfully traverses the conclusions in the Office Action with reference to the discussion above. Applicant submits that the rejection is thus misplaced.

Independent claim 22 is apparently overlooked in the Office Action, since none of the subject matter therein is addressed in the Office Action. Claim 22 defines a method of forming a construction beam including, *inter alia*, placing at least one reinforcing rod under tension in a tubular housing. As noted above, Chatelain lacks any teaching or suggestion of placing its reinforcing bars 48 under tension. In fact, such a construction would be practically impossible in constructing a fence post since the concrete is poured directly into the form and into a hole in the ground. In addition, claim 22 further defines a step of filling the tubular housing with a solid material such that the solid material surrounds the at least one reinforcing rod. In contrast, the reinforcing bars 48 in Chatelain are inserted into the concrete after the concrete has been poured. See, column 3, lines 21-24. Still further, claim 22 additionally recites that the tubular housing forms a part of the construction beam, which as also discussed above, is lacking in the Chatelain patent. For at least these reasons, Applicant respectfully submits that the rejection of claim 22 is misplaced.

With respect to the dependent claims, Applicant submits that these claims are allowable at least by virtue of their dependency on an allowable independent claim. In addition, claim 19 recites that the securing step (of claim 18) comprises placing the at

least one reinforcing rod under tension prior to filling the tubular housing with the solid material such that the reinforcing rod is pre-stressed in the tubular housing. As discussed above, this subject matter is neither taught nor suggested in the Chatelain patent. Indeed, Chatelain teaches away from such construction via its formation of fence posts.

Reconsideration and withdrawal of the rejection are thus respectfully requested.

Applicant acknowledges with appreciation that claim 21 has not been rejected over prior art.

In view of the foregoing remarks, Applicant respectfully submits that the claims are patentable over the art of record and that the application is in condition for allowance. Should the Examiner believe that anything further is desirable in order to place the application in condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Prompt passage to issuance is earnestly solicited.

Respectfully submitted,

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Attachment: *Marks' Standard Handbook for Mechanical Engineers*, pp. 12-23 through 12-25

Kind of masonry	Cement mortar lb/in²	Cement mortar kg/cm²	Cement-lime mortar lb/in²	Cement-lime mortar kg/cm²	Lime mortar lb/in²	Lime mortar kg/cm²
Stone ashlar	400	28.1	320	22.5	250	17.6
Rubble	300	21.1	100	7.0	80	5.6
Brickwork	175	12.3	140	9.3	75	5.3
Hollow building blocks	80	5.6	70	4.9		

The allowable stresses in brickwork may be increased 33 percent when the individual bricks have a compressive strength of 3,500 and a modulus of rupture of 600 lb/in². Local pressure under concentrations of load may exceed the stresses in the table by 25 percent.

Plain Concrete (see Sec. 6) The allowable working stresses in plain concrete walls and piers are as follows:

Strength varies widely according to material, arrangement of reinforcement, and workmanship. Design procedures are similar to those for reinforced concrete.

Reinforced Concrete **Efflorescence** on the face of brickwork can be reduced and sometimes avoided by waterproofing the mortar with an admixture of ammonium or calcium stearate, 2 percent by weight of the cement and lime.

Approx proportions	Water, gal per sack of cement	Strength, 28 days lb/in²	Strength, 28 days kg/cm²	Allowable stress lb/in²	Allowable stress kg/cm²
1-2½-5	8.00	1,500	105.5	375	26.3
1-2-4	7.50	2,000	140.6	500	35.2
1-1½-3	6.75	2,500	175.8	625	43.9
1-1-2	6.00	3,000	210.9	750	52.7

Reinforced Masonry Bricks and building blocks may be used structurally when core spaces are partially or completely filled with concrete and reinforcing bars are embedded.

TIMBER CONSTRUCTION

Floors The framing of wooden floors may be divided into two general types: joist construction and solid, or mill, construction. The first consists of **joists** 2 to 6 in wide, of the necessary depth, and spaced about 12 to 16 in (30 to 40 cm) on centers. The wall ends should rest on and be anchored to walls and the interior ends carried by a line of girders on columns. These joists should be securely cross-bridged not over 8 ft (2.4 m) apart in each span to prevent twisting and to assist in distributing concentrated loads. Solid blocking should be provided at ends and at each point of support. The floor is formed of a thickness of rough boarding on which the finish flooring is laid. **Solid** or **mill-construction floors** are designed to do away with the small pockets which exist in joist construction and thus reduce the fire hazard. They are generally framed with beams spaced 8 to 12 ft (2.4 to 3.6 m) on centers and spanning 18 to 25 ft (5.5 to 7.6 m). The wall ends of beams rest on and are anchored to the wall, and the interior ends are carried on columns and tied together to form a continuous tie across the building. Ends of timbers in masonry walls should have metal bearing plates and ½ in space at sides and end for ventilation, to prevent rot. The ends should be beveled and the anchors placed low to avoid overturning the wall if the beams drop in a fire. In all cases, care should be taken to provide sufficient bearing at the points of support so that the allowable intensity of compression across the grain is not exceeded. In case it is desirable to omit columns, or the floor load requires a closer spacing of beams, girders are run lengthwise of the building over the columns to take the beams, the ends of which are hung in hangers or stirrup irons and tied together, over or through the girders. This is called **intermediate framing.** Steel beams are sometimes used in place of wooden beams in this type of construction, in which case a wooden strip is bolted to the top flange of the beam to take the nailing of the plank, or the plank is laid directly on top of the beam and secured by spikes driven from below and clinched over the flange. The floor is formed of 3 or 4 in (7.5 or 10 cm) plank grooved in each edge, put together with splines and securely spiked to beams. On top of the plank is laid flooring, with a layer of sheathing paper between. In case the floor loads require an excessive thickness of plank, or in localities where heavy plank is not easily obtainable, the floor is built up of 3 × 6 in (7.5 × 15 cm), or other sized pieces, placed on edge, and securely nailed together.

The roofs of buildings of joist and mill construction are framed in a manner similar to the floors of each type and should be securely anchored to the walls and columns. In case columns are not desired in the top story, steel beams or trusses of either steel or wood are used. For spans up to 35 ft (10.7 m), trussed beams can often be used to advantage.

For **unit stresses in timber,** see Sec. 6. For unit stresses in wooden columns, see Table 9. Table 7 gives the properties of mill floors made of dressed plank, and of laminated floors made of planks on edge, laid close.

Timber Beams

Properties of Timber Beams Table 8 presents those properties of wooden timbers most useful in computing their strength and deflection as beams. The "nominal size" of a timber is indicated by the breadth and depth of the section in inches. The "actual size" indicates the size of the dressed timber, according to National Lumber Manufacturers Assoc. The moment of inertia and section modulus are with the neutral axis perpendicular to the depth at the center. The **safe bending moment** in inch-pounds for a given beam is determined

Table 7. Properties of Plank and Solid Laminated Floors
(b = breadth = 12 in, f = fiber stress)

Nominal thickness or depth, in (1)	Actual thickness d, in (S4S) (2)	Area of section $A = bd$, in² (3)	Moment of inertia $I = bd^3/12$, in⁴ (4)	Section modulus $S = bd^2/6$, in³ (5)	Safe load, lb/ft² on 1-ft span*: f = 1,000 lb/in²† (6)	Safe load, lb/ft² on 1-ft span*: f = 1,600 (7)	Coef of deflection, uniform load‡: E = 1,000,000 (8)	Coef of deflection, uniform load‡: E = 1,760,000 (9)
1	¾	9.00	0.422	1.13	753	1,205	53.4	93.98
1½	1¼	15.00	1.95	3.13	2,085	3,336	11.51	20.26
2	1½	18.00	3.38	4.50	3,000	4,800	6.66	11.72
2½	2	24.00	8.00	8.00	5,334	8,534	2.82	4.96
3	2½	30.00	15.60	12.50	8,334	13,334	1.441	2.54
4	3½	42.00	42.9	24.5	16,334	26,134	0.524	0.922
5	4½	54.00	91.1	40.5	27,000	43,200	0.247	0.1404
6	5½	66.00	166.4	60.5	40,300	64,500	0.1348	0.0765
8	7½	90.00	422	112.5	75,000	120,000	0.0533	0.0303
10	9½	114.00	857	180.5	120,400	192,500	0.0263	0.0149
12	11½	138.00	1,521	264.5	176,400	282,000	0.0148	0.0084

*Divide tabular value by square of span in feet.
†For other fiber stress f, multiply tabular value by $f/1{,}000$.
‡For deflection in, multiply coefficient by load, lb/ft², and by fourth power of span in ft, and divide by 1,000,000. For other modulus of elasticity E, multiply coefficient of col. 8 by 1,000,000, and divide by E.

from the section modulus S by multiplying the tabular value by the allowable fiber stress. To select a beam to withstand safely a given bending moment, divide the bending moment in inch-pounds by the allowable fiber stress, and choose a beam whose section modulus S is equal to or larger than the quotient thus obtained. For formulas for computing bending moments, see Sec. 5.

Maximum loads in Table 8, cols. 7 and 8, are for uniform loading. Use half the values of col. 7 for a single load concentrated at midspan; for other loadings compute the bending moment and use the section modulus, col. 6. The values of col. 8 apply to all symmetrical loadings. For unsymmetrical loading, compute the maximum shear, which must not exceed one-half the tabular value.

The **coefficients of deflection** given are the deflections, in inches, of beams 1 ft in span, with a uniformly distributed load of 1,000,000 lb, the modulus of elasticity being taken at 1,000,000 lb/in². The deflection of a beam of a given span under uniformly distributed load is obtained by multiplying the coefficient of deflection of the beam by the cube of the span in feet and by the number of 1,000,000 lb units in the given load and by dividing by the number of 1,000,000 lb/in² units in the actual modulus of elasticity. Coefficients of deflection under concentrated loads applied at the middle of the span may be obtained by multiplying the values in the table by 1.6. The results are only approximate, as the modulus of elasticity varies with the moisture content of the wood.

The deflection of beams intended to carry plastered ceilings should not exceed 1/360 of the span.

A convenient rule may be derived by assuming that the modulus of elasticity is 1,000 times the allowable fiber stress, which applies to all woods with sufficient accuracy for the purpose. Beams loaded uniformly to capacity in bending will then deflect 1/360 of the span when the depth in inches is 0.90 times the span in feet; and beams with central concentration, when the depth is 0.72 times the span in the same units. For such beams, the deflection in inches is, for uniform load, $0.03L^2/d$; for central concentration, $0.024L^2/d$, where L is the span, ft and d the depth, in. Variation in type of loading affects this result comparatively little.

Timber Columns

Timber columns may be either square or round and should have metal bases, usually galvanized steel, to cut off moisture and prevent lateral displacement. For supporting beams, they should have caps which, at roofs, may be of steel, or wood designed for bearing across the grain. At intermediate floors, caps should be of steel, although in some cases hardwood bolsters may be used. Except when caps or beams are of steel, columns should run down and rest directly on the baseplate. Table 9 gives **working unit stresses for wooden columns** recommended where the building laws do not prescribe lower stresses. Use actual, not nominal, dimension of timbers. The formula for columns on which Table 9 is based is $P/A = 0.30E/(l/d)^2$. The maximum unit stress should not exceed the allowable unit stress in compression parallel to grain c, as set forth in Sec. 6. When computing l/d, both axes of the column should be investigated.

Stud Partitions Table 10 gives the safe load in pounds per linear foot of partition, based on both capacity of the studs as columns and bearing across the grain of the plate or sill. Stresses used are those recommended above. Note that the capacity of the studs is generally more in low partitions than the values for cross bearing unless a hardwood is used for the sill and plate. It is well, however, to provide a margin of strength in the studs to cover cutting for wires, etc.

Glued Laminated Timber Structural glued laminated timber, commonly called glulam, refers to members which are fabricated by pressure gluing selected wood laminations of either ¾ or 1½ in (19 or 38 mm) surfaced thickness. The grain of all the laminations is approximately parallel longitudinally, with exterior laminations being of generally higher-quality wood since bending stresses are greater at the outer fibers. Curved and tapered structural members are available with the recommended minimum radii of curvature being 9 ft 4 in (2.84 m) for ¾-in laminations and 27 ft 6 in (8.4 m) for 1½-in

Table 8. Properties of Wooden Beams (Surfaced Size)

Nominal size, in (1)	Actual size $b \times d$, in, dressed (S4S) size (2)	Area of section bd, in² (3)	Weight at 40 lb/ft³, lb/ft (4)	Moment of inertia $I = bd^3/12$, in⁴ (5)	Section modulus $S = bd^2/6$, in³ (6)	Max safe uniform load, lb, based on: Bending on 1 ft span,* f = 1,000 lb/in² (7)	Max safe uniform load, lb, based on: Shear at 100† lb/in² (8)	Coef‡ of deflection, uniform load E = 1,000,000 (9)
2 × 4	1½ × 3½	5.25	1.46	5.36	3.06	2,040	700	4.20
3 × 4	2½ × 3½	8.75	2.43	8.93	5.10	3,400	1,166	2.52
4 × 4	3½ × 3½	12.25	3.40	12.51	7.15	4,760	1,632	1.80
2 × 6	1½ × 5½	8.25	2.29	20.8	7.56	5,040	1,100	1.082
3 × 6	2½ × 5½	13.75	3.82	34.7	12.60	8,390	1,835	0.648
4 × 6	3½ × 5½	19.25	5.35	48.5	17.65	11,760	2,570	0.464
6 × 6	5½ × 5½	30.3	8.40	76.3	27.7	18,490	4,040	0.295
2 × 8	1½ × 7¼	10.87	3.02	47.6	13.14	8,760	1,445	0.473
3 × 8	2½ × 7¼	18.12	5.04	79.4	21.9	14,600	2,410	0.284
4 × 8	3½ × 7¼	25.4	7.05	111.1	30.7	20,500	3,380	0.202
6 × 8	5½ × 7½	41.3	11.4	193	51.6	34,400	5,500	0.1162
8 × 8	7½ × 7½	56.3	15.6	264	70.3	46,900	7,500	0.0852
2 × 10	1½ × 9¼	13.87	3.85	98.9	21.4	14,290	1,850	0.227
3 × 10	2½ × 9¼	23.1	6.42	164.9	35.7	23,700	3,080	0.1364
4 × 10	3½ × 9¼	32.4	8.93	231	49.9	33,300	4,310	0.0974
6 × 10	5½ × 9½	52.3	14.5	393	82.7	55,200	6,970	0.0573
8 × 10	7½ × 9½	71.3	19.8	536	113	75,200	9,500	0.0421
10 × 10	9½ × 9½	90.3	25.0	679	143	95,300	12,030	0.0332
2 × 12	1½ × 11¼	16.87	4.69	178	31.6	21,100	2,250	0.1264
3 × 12	2½ × 11¼	28.1	7.81	297	52.7	35,100	3,750	0.0757
4 × 12	3½ × 11¼	39.4	10.94	415	73.9	49,300	5,250	0.0543
6 × 12	5½ × 11½	63.3	17.5	697	121	80,800	8,430	0.0323
8 × 12	7½ × 11½	86.3	23.9	951	165	110,200	11,510	0.0237
10 × 12	9½ × 11½	109.3	30.3	1,204	209	139,600	14,570	0.01864
12 × 12	11½ × 11½	132.3	36.7	1,458	253	169,000	17,620	0.01543
4 × 14	3½ × 13¼	46.4	12.88	678	102.4	68,300	6,180	0.0332
6 × 14	5½ × 13½	74.3	20.6	1,128	167	111,400	9,900	0.01987
8 × 14	7½ × 13½	101.3	28.0	1,538	228	152,000	13,500	0.01462
10 × 14	9½ × 13½	128.3	35.6	1,948	289	192,400	17,120	0.01153
12 × 14	11½ × 13½	155.3	43.1	2,360	349	233,000	20,700	0.00953
14 × 14	13½ × 13½	182.3	50.6	2,770	410	273,000	24,300	0.00812
6 × 16	5½ × 15½	85.3	23.6	1,707	220	146,800	11,380	0.01315
8 × 16	7½ × 15½	116.3	32.0	2,330	300	200,000	15,530	0.00967
10 × 16	9½ × 15½	147.3	40.9	2,950	380	254,000	19,610	0.00762
12 × 16	11½ × 15½	178.3	49.5	3,570	460	307,800	23,800	0.00630
14 × 16	13½ × 15½	209	58.1	4,190	541	360,000	27,900	0.00539
16 × 16	15½ × 15½	240	66.7	4,810	621	414,000	32,000	0.00468
8 × 18	7½ × 17½	131.3	36.4	3,350	383	255,000	17,500	0.00672
10 × 18	9½ × 17½	166.3	46.1	4,240	485	323,000	22,200	0.00531
12 × 18	11½ × 17½	201	55.9	5,140	587	391,000	26,800	0.00438
14 × 18	13½ × 17½	236	65.6	6,030	689	459,000	31,500	0.00373
16 × 18	15½ × 17½	271	75.3	6,920	791	528,000	36,200	0.00325
18 × 18	17½ × 17½	306	85.0	7,820	893	595,000	40,800	0.00288
12 × 20	11½ × 19½	224	62.3	7,110	729	485,000	29,900	0.00316
20 × 20	19½ × 19½	380	106	12,050	1,236	824,000	50,700	0.00187
24 × 24	23½ × 23½	552	153	25,400	2,160	1,440,000	73,400	0.000888
26 × 26	25½ × 25½	650	180.6	35,200	2,760	1,840,000	86,700	0.000639
28 × 28	27½ × 27½	756	210	47,700	3,470	2,320,000	100,600	0.000472
30 × 30	29½ × 29½	870	242	63,100	4,280	2,850,000	116,000	0.000356

*For total safe uniform load, pounds, on beam of span L, feet, divide tabular value by L. For fiber stress f other than 1,000 lb/in² multiply by f and divide by 1,000.

†For shearing stress other than 100 lb/in², multiply by stress and divide by 100.

‡For deflection, inches, multiply coefficient by total load, pounds, and by cube of span, feet, and divide by 1,000,000. For other modulus of elasticity E, multiply coefficient by 1,000,000 and divide by E.

lamination thickness. Laminations should be parallel to the tension face of members; sawn tapered cuts are permitted on the compression face.

Available net (surfaced) widths of members in inches are 2¼, 3⅛, 5⅛, 8¾, 10¾, 12¼, and 14¼; depths are determined by stress requirements. Economical spans (see "Timber Construction Manual," American Institute of Timber Construction) for roof framing range from 10 to 100 ft (3 to 30 m) for